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DAS Data Requirement 18

Demand Access System (DAS) Training Plan (TP)

System Level and Level 2 Training

PREPARED BY:

ITT INDUSTRIES
ADVANCED ENGINEERING AND SCIENCES DIVISION (AES)
1761 BUSINESS CENTER DRIVE
RESTON, VA 20190-5337

Advanced Engineering & Sciences
1761 Business Center Drive, Reston, Virginia 20190-5337

ITT Industries
Engineered for life

CHANGE RECORD

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1. SCOPE

1.1 IDENTIFICATION

This Training Plan (TP) defines the training required to prepare the appropriate White Sands and Guam personnel to support the operations and maintenance of the Demand Access System (DAS). The TP and the subsequent Training Materials shall provide training for system-level operations, and Level-1 and Level 2 hardware and software maintenance procedures. ITT shall ensure that the training plan, policies, procedures and materials comply with the provisions of Section 8 of the DAS System Requirements Document (SRD), 453-SRD-DAS. This TP is submitted to fulfill the requirements of Deliverable Requirements List (DRL) 18 in conjunction with the performance of the DAS contract.

1.2 TRAINING PLAN SCOPE

System-level operations shall include a general description of the system architecture, the theory of operations, description of DAS system components, detailed explanation of all system component controls, readouts, operating procedures, and graphical user interface (GUI) screen displays.

Level-1 maintenance is defined as the operational, preventive, and corrective maintenance procedures required to support nominal operations and to provide on-site replacement of Line Replaceable Units (LRUs) to return the system to its operational capability. Level-1 corrective maintenance shall include:

- Fault isolation to the LRU level
- Replacement of a failed LRU
- Tests to ensure that the system has been restored to operational condition
- Alignment and tuning

Level-2 maintenance is defined as the procedures to enable WSC Hardware Maintenance Department (HMD) and Software Maintenance Test Facility (SMTF) personnel to maintain and repair DAS hardware and software, and shall include the following:

- Localizing a failure to the piece-part or equipment component level, as appropriate
- Disassembling and removing the failed piece-part or equipment component
- Replacing failed elements and reassembling the failed piece-part or equipment component
- Bench testing to ensure performance to the specified level.

Software-unique Level-2 maintenance training shall consist of program and database maintenance. This will include activities necessary to modify or enhance software packages by implementing software revisions and to correct software problems (bugs).

1.3 SYSTEM OVERVIEW

The purpose of the DAS is to expand existing Tracking and Data Relay Satellite System (TDRSS) Multiple Access Return (MAR) capabilities. The DAS will build upon the Third Generation Beamformer Subsystem (TGBFS) development by adding global system control and coordination functions and data distribution capabilities.

The approach of the DAS product development and deployment is to establish a basic operational infrastructure. The basic infrastructure will consist of all the control/monitoring, switching and data storage capabilities to facilitate expansion of beamforming and data demodulation. The initial infrastructure will have a single Independent Beamforming Unit Group (IBUG) and Demodulator Group (DMG) for each of the three TDRS regions. Two IBUGs and one DMG will be installed at the White Sands Ground Terminal (WSGT) in New Mexico and one IBUG and DMG at the Guam Remote Ground Terminal (GRGT). The full operational capability will include ten IBUGs and eight DMGs at WSGT and in GRGT to service a maximum of fifty customer data streams at each location.

1.4 APPLICABLE DOCUMENTS

1.4.1 Program Documents

450-PG-8700.2.2A	Systems Management Plan, Paragraph 4.2.2
028-600000	ITT DAS Product Management Plan (PMP)
453-DAS-SRD	DAS System Requirements Document
453-DAS-OCD	DAS Concept of Operations
GPG 3410.2E	Employee Training and Qualification
STDN 507	Space Network Logistics Manual
530-WSC-LOP	The WSC Handbook Series, Volume Set
ISO 9000	Quality Assurance Plan
015-600012	DAS Operations and Maintenance (O&M) Manual
TBD	SWSI Users Guide
015-140893	Operation and Maintenance Manual for the Element Multiplexer/Correlator (EMC) and the EMC Controller
015-146722	Operation and Maintenance Manual for the Independent Beamforming Unit Group (IBUG) and the IBUG Controller
	Basic IBUG/ICON O&M Training Curriculum
	Detailed O&M of IBUG Hardware Training
	Basic EMC/ECON O&M Training Curriculum
453-ICD-DAS/SWSI	Interface Control Document between Demand Access System (DAS) and Space Network (SN) Web Services Interface (SWSI)
453-ICD-DAS/Customers	Interface Control Document between the Demand Access System (DAS) and DAS Customers

453-ICD-DAS/WSC	Interface Control Document between the Demand Access System (DAS) and the White Sands Complex (WSC) Systems

1.4.2 Reference Documents

541-PG-7120.2.A	Space Network (SN) Program Plan

2. TRAINING ORGANIZATION AND RESPONSIBILITIES

2.1 GOVERNMENT ORGANIZATION

2.1.1 Government Responsibilities

The NASA DAS Product Management Plan (PMP) describes and documents the organization, methodology and tools to be used in managing the DAS program. Examples of management activities are to direct and control system definition, design development, and validation of the system. The NASA Space Network (SN) (GSFC Code 453) organization and responsibilities are described in the SN Program Plan (541-PG-7120.2.1A).

2.1.2 Government Training Responsibilities

The White Sands Complex (WSC), which includes WSGT and GRGT, has the resources and personnel support required to (1) operate the DAS, (2) maintain, modify, and repair DAS hardware and (3) maintain, modify and enhance DAS software. Hardware maintenance is performed under a formally established system maintenance program that includes both Preventive Maintenance and Corrective Maintenance procedures. Software maintenance comes under the purview of the SMTF.

In conjunction with this DAS training program, the Government will be required to conduct the activities listed in Table 2-1. Suggested dates for completion of the training–related activities are based on the overall training schedule in Table 2-2.

Table 2-1: Government Training Responsibilities

Activity	Suggested Completion Date
Identify the appropriate personnel to receive DAS basic system training for operations and maintenance.	For all courses, ITT will require the number of students 5 days in advance for preparation of course materials
Ensure that identified WSC personnel from WSGT and GRGT attend the scheduled training sessions as required or make allowances for them to makeup missed class sessions.	9/3/02 – 9/7/02 (WSGT Session 1 Basic Training) 9/23/02 – 9/27/02 (WSGT Session 2 Basic Training) 9/3/02 – 9/7/02 (GRGT Basic Training) 9/30/02 – 10/4/02 (WSGT Level 2 H/W Training) 10/7/02 – 10/18/02 (WSGT Level 2 S/W Training)
Review contractor proposed certification requirements for training course completion.	Certification procedures are provided in this Plan. Recommend approval not later than 7/22/02 (delivery date for draft training materials)
Provide the training facilities at White Sands and Guam for the contractor to conduct DAS training.	Schedule in advance consistent with policies at WSC for the dates listed above
Provide the classroom equipment and resources required for course instruction as requested by the training team instructors.	Schedule in advance consistent with policies at WSC for the dates listed above
Provide administrative support to the contractor training team to implement the training program during the scheduled training sessions.	9/3/02 – 9/7/02 (WSGT Session 1 Basic Training) 9/23/02 – 9/27/02 (WSGT Session 2 Basic Training) 9/3/02 – 9/7/02 (GRGT Basic Training) 9/30/02 – 10/4/02 (WSGT Level 2 H/W Training) 10/7/02 – 10/18/02 (WSGT Level 2 S/W Training)
Work with the contractor training course coordinator to resolve any problems encountered during the development or administration of the	As required.

training course to ensure that the training is a success.	

2.2 CONTRACTOR ORGANIZATION

2.2.1 ITT Management Responsibilities

The DAS hardware and software are being developed, integrated and deployed by ITT Advanced Engineering and Sciences in Reston, Virginia. ITT will provide Training and O&M Manual development. The ITT DAS PMP describes and documents the ITT organization, methodology and tools to be used in managing the DAS program. It also defines the Contract Work Breakdown Structure established to plan, control, and measure all program activities and the master milestone schedule and deliverables for accomplishing the program objectives. DAS training activities and milestones are provided in the master schedule. ITT Configuration Management and Quality Assurance policies and procedures contained in ISO 9000 Quality Manual, Operating Procedures and Work Instructions shall be used on the DAS program. Quality audits shall be used to ensure that these policies and procedures are followed throughout the training course development and administration.

2.2.2 ITT Training Responsibilities

ITT will develop and deliver an O&M Manual to the Government in accordance with the DAS DRL 17 and a Training Plan and Materials in accordance with DAS DRL 18. ITT also will provide essential training to support the operations and maintenance of the DAS after delivery, including:

- Operational training for WSGT and GRGT personnel as designated by the Government.
- Level-1 basic maintenance training for WSGT and GRGT personnel.
- Level-2 hardware and software maintenance training for WSGT personnel
- Providing qualified instructors to conduct on-site training at WSC.
- Conducting the training courses as scheduled and according to the course objectives.
- Administering a final examination to all qualified students at the conclusion of each training course to assess their level of mastery of the course learning objectives.
- Assigning a training course coordinator to oversee the overall training activities to include:
    - Developing the Training Plan.
    - Developing the Training Course Materials.
    - Administering the training courses to ensure that the training objectives are met.
    - Delivering the Instructor Evaluations by the students to the Government at the conclusion of the training courses.
    - Providing a list of those students recommended for certification/course credit at the conclusion of the training.

2.2.3 Schedule of Training Activities

Table 2-2 summarizes the major training activities for the DAS program. Completion dates are the currently scheduled deadlines proposed for the listed activities. Dates are subject to modification based on the availability of WSGT and GRGT personnel, resources and other conflicting high priority, operational events, such as shuttle launches. Scheduled event details are provided in the Baseline DAS Schedule (DRL 4). The initial training will be provided in two identical sessions as shown in Table 2-2 so that students unavailable to attend session 1 may attend the following session 2.

Table 2-2: Major Training Milestones and Activities

Activity	Completion/Performance Dates
Training Plan (Draft)	11/12/01
Government Review (Training Plan)	11/13/01 – 1/2/02
Training Plan (Final)	2/08/02
Training Plan with Level 2 Maintenance Revisions (Draft)	3/29/02
Training Plan with Level 2 Maintenance Revisions (Final)	5/13/02
DAS O&M Manual (Draft #1)	3/25/02
DAS O&M Manual (Draft # 2)	4/25/02
DAS O&M Manual (Final Draft)	5/20/02
Government Review (DAS O&M Manual)	5/21/02 – 6/3/02
DAS O&M Manual (Final)	6/20/02
Level-2 H/W Maintenance Manuals (Draft)	8/5/02
Government Review (Level-2 H/W Maintenance Manuals)	8/6/02 – 8/16/02
Level-2 H/W Maintenance Manuals (Final)	8/30/02
Level-2 S/W Maintenance Manuals (Draft)	8/12/02
Government Review (Level-2 S/W Maintenance Manuals)	8/13/02 – 8/26/02
Level-2 S/W Maintenance Manuals (Final)	9/9/02
Basic DAS Training Materials (Draft)	7/22/02
Government Review (Basic DAS Training Materials)	7/23/02 – 8/5/02
Basic DAS Training Materials (Final)	8/19/02
Level-2 H/W Training Materials (Draft)	8/19/02
Government Review (Level-2 H/W Training Materials)	8/20/02 – 8/29/02
Level-2 H/W Training Materials (Final)	9/16/02
Level-2 S/W Training Materials (Draft)	8/26/02
Government Review (Level-2 S/W Training Materials)	8/27/02 – 9/12/02
Level-2 S/W Training Materials (Final)	9/23/02
Training: Ops/Level 1 Maintenance	9/3/02 – 9/7/02 (session1) 9/23/02 – 9/27/02 (session 2)
Training: GRGT Ops/Level 1 Maintenance	9/3/02 – 9/7/02
Training: WSGT Ops/Level 2 Maintenance	9/30/02 – 10/4/02 (H/W) 10/7/02 – 10/18/02 (S/W)

The development of the training materials closely parallels the development of the DAS O&M Manual and Level-2 Maintenance Manuals in that, as information is incorporated into the manuals, the information is subsequently incorporated into the training materials. This is to ensure consistency between the related deliverables. Consequently, draft manuals will be provided to the Government for review, followed by the delivery of the draft training materials, as indicated in Table 2-2. Estimated periods of time recommended for Government review of the documentation also are provided in Table 2-2. Adherence to these proposed dates will ensure compliance with the planned schedule.

3. TRAINING FACILITIES

3.1 GOVERNMENT FACILITIES

3.1.1 WSGT

The WSC WSGT has classroom facilities to accommodate 15 students. The room is equipped with white boards, and an overhead projector.

A second classroom contains five Personal Computers (PCs) running Windows NT (4.0) for computer-based training.

Small groups of students, up to five per group, can be instructed in front of the equipment on a noninterference basis with the DAS installation, testing or operations.

For the DAS initial training course and the Level-2 training courses, the use of all these facilities is anticipated. The introductory portion of the initial training course will be conducted in any classroom facility with overhead projection capability. The largest audience is anticipated for this portion of the course, since anyone interested in learning about DAS would find this information beneficial.

A classroom facility with PCs available for the students will be used for computer-based access to the DAS O&M Manual and all hardware and software maintenance manuals, which will be provided to all students in CD-ROM format.

Hands-on practical demonstrations of the hardware and software in front of the DAS equipment will serve to reinforce the information presented in the course classroom presentations.

Small groups of students, up to five per group, may be instructed in the HMD on a noninterference basis with ongoing maintenance activities. The HMD contains ESD-safe workstations suitable for hands-on maintenance demonstrations.

3.1.2 GRGT

At Guam, the Operations Room may be used for training. A white board and a copy machine are available for classroom presentations and administrative support. Just as at WSGT, hands-on practical demonstrations of the hardware and software may take place in front of the DAS equipment to reinforce the information presented in the course classroom presentations.

3.2 CONTRACTOR FACILITIES

Since a training requirement is to maximize the use of WSC facilities in conducting this training, the use of ITT facilities is not anticipated for the initial basic system-level DAS training or for Level-2 training.

Should the Government require more advanced training for some DAS personnel, such as for additional instructors or DAS system administrators, the use of ITT facilities will be provided if this is in the best interest of the Government. For example, a DAS system administrator may benefit from additional Oracle database training or in-depth training on SWSI client-server operations. In this case, it may be more beneficial to provide this training at ITT–Reston or at NASA Goddard Space Flight Center (GSFC). Contractor facilities can be made available, if required, but their use is not currently planned for the initial operator and line maintenance technician training, nor for the Level-2 training.

4. TRAINING APPROACH

4.1 TRAINING METHOD

The contractor will provide training course curricula that meet the training requirements specified in the DAS SRD, 453-SRD-DAS. The conduct of the training shall provide for an orderly transition into sustained operations and maintenance. The overall training method shall consist of a combination of classroom lectures, practical exercises, self-study sessions, and hands-on demonstrations. The hands-on demonstrations will be conducted on a not-to-interfere basis with actual operations or maintenance activities. Course instructors shall be contractor employees with in-depth knowledge in the subject matter being taught. Student Learning Objectives will be presented at the beginning of the courses, and an evaluation of the degree to which the students master an understanding of those objectives will be made at the completion of the courses. The format of the training materials shall be modularized and to the maximum extent practicable, individualized for use based on a student's previous experience levels.

4.1.1 Objectives

The contractor shall ensure that the following objectives and requirements, described in the succeeding paragraphs, are met in conducting DAS training.

4.1.1.1 Course Concentration

Training shall prepare operations and maintenance personnel, including both Government and contractor employees to operate, maintain and support DAS. The initial training program shall concentrate on maintenance and operations at the DAS system level to include troubleshooting and fault isolation of DAS subsystems down to the LRU level. The Level-2 training program will concentrate on corrective maintenance (disassembly and repair) of DAS hardware at the piece-part or equipment component level, and program and database maintenance to upgrade/revise DAS software as necessary, and/or to correct software deficiencies.

4.1.1.1.1 Operations

Operations personnel shall be trained to perform operations functions according to WSC Local Operating Procedures as specified in WSC Handbook Series, Volume Set, 530-WSC-LOP.

4.1.1.1.2 Maintenance

Maintenance personnel shall be trained to maintain DAS subsystems in order to meet maintainability requirements. For the purposes of the DAS system training, this maintenance training shall certify maintenance technicians to perform Level-1 corrective and preventive maintenance. For the purposes of the DAS Level-2 training, this maintenance training shall certify maintenance technicians to perform Level-2 corrective maintenance.

4.1.2 Course Duration and Content

4.1.2.1 DAS System-Level Training

The initial DAS system-level training course shall consist of 40 hours of instruction over five days duration, and barring any unforeseen schedule conflicts, the course will be repeated once over a second five-day period to accommodate operations and maintenance personnel, who were not available for the first course session.

The initial DAS system-level training course content will be organized into three key areas: (1) DAS Introduction; (2) DAS Operations; and (3) DAS Maintenance. Depending upon job requirements and student interests', all or portions of the initial training course may be taken. Descriptions of each area of instruction are provided in the following paragraphs.

4.1.2.1.1 DAS Introduction

The course will begin the DAS Introduction with classroom presentations of the student learning objectives, followed by an overview of the DAS system architecture, the concept of operations and how key design features are supported by the various component subsystems of DAS. In addition, an overview of the SWSI system and the DAS Ground Rules will be presented so that students may gain an understanding of the primary DAS customer interface and operations. A functional description of all DAS subsystems will be provided. Subsystem equipment controls, indicators and front panel display features will be presented. This information will be useful for any personnel with a need to be familiar with the operations of DAS. Twenty percent of the course content or one day (eight hours) of a five-day course will be devoted to DAS Introduction.

4.1.2.1.2 DAS Operations

This area of the course will present detailed information on DAS operations including key design features. This will include a description of all software subsystem graphical user interface (GUI) screens, how the hierarchical control subsystems (DASCON, DCON, ICON and ECON) are interrelated and interoperate, and detailed DAS operational procedures. This information will be essential for all DAS operations personnel. Sixteen hours of course instruction will be allocated to DAS Operations.

4.1.2.1.3 DAS Maintenance

The third segment of the training course content will consist of Level-1 maintenance. This segment includes the DAS maintenance concept for hardware and software, preventive and corrective maintenance practices, alarm conditions, available tools and test equipment, fault isolation and diagnostics, and high-level discussions of the operational and support software code structure within DAS. This portion of the course will prepare students to be certified to identify fault conditions and replace subsystem LRUs during operations. Software unique maintenance training, such as debugging techniques and high order language use, will not be addressed in this initial training. Fifteen hours of instruction will be allocated to DAS Maintenance. One hour will be provided for the course examination and completion of the student evaluation forms.

4.1.2.1.4 Course Outline

The course content shall provide training in the following areas of DAS:

Course Title: Demand Access System Basic Operations and Level-1 Maintenance (40 hours)

1.0 DAS INTRODUCTION (8 hours)
- 1.1 Course Objectives and Purpose
- 1.2 General Description: Demand Access System (DAS)
- 1.3 General Physical and Functional Descriptions of DAS Reference Architecture
  - 1.3.1 EMC Interface
  - 1.3.2 IBUG
  - 1.3.3 IF Switch
  - 1.3.4 DMG
  - 1.3.5 Archive/Server (PTP)
  - 1.3.6 DASCON
  - 1.3.7 DCON
  - 1.3.8 ICON
  - 1.3.9 ECON
  - 1.3.10 Timing and Frequency
  - 1.3.11 Power and Mechanical
  - 1.3.12 Network (Ethernet) Equipment

2.0 DAS OPERATIONS (16 hours)
- 2.1 Theory of Operation
  - 2.1.1 Overall Theory of Operation
  - 2.1.2 Detailed Theory of Operation
- 2.2 SWSI Interface
  - 2.2.1 SWSI Architecture and DAS/SWSI Interface
  - 2.2.2 DAS Customer SWSI Screens
  - 2.2.3 DAS Ground Rules Overview/SWSI User Guide
  - 2.2.4 International Earth Rotation Service (IERS) Upload Procedures
- 2.3 DASCON
  - 2.3.1 Operator Screens and Screen Flow
    - 2.3.1.1 Access
    - 2.3.1.2 Main Alert Screen
    - 2.3.1.3 Alarm Control
    - 2.3.1.4 Main Screen
    - 2.3.1.5 DASCON Schedule Maintenance
    - 2.3.1.6 DASCON Schedule SGLT
    - 2.3.1.7 DASCON Event
    - 2.3.1.8 Service Setup
    - 2.3.1.9 Service Detail
    - 2.3.1.10 DMU Configuration
    - 2.3.1.11 DSER User Configuration
    - 2.3.1.12 Ephemeris
    - 2.3.1.13 DAS Parameter Setup
    - 2.3.1.14 DAS Report
    - 2.3.1.15 DATA Archiving
    - 2.3.1.16 IBU Configuration
    - 2.3.1.17 DASCON Software Status
    - 2.3.1.18 WSC and GRGT Main
    - 2.3.1.19 WSC and GRGT EMC/ECON
    - 2.3.1.20 WSC and GRGT FO Switch
    - 2.3.1.21 WSC and GRGT IBUG ICON
    - 2.3.1.22 WSC and GRGT ICON
    - 2.3.1.23 WSC and GRGT Fixed Weight

2.3.1.24 WSC and GRGT IF Switch
2.3.1.25 WSC and GRGT DMG/DCON
2.3.1.26 WSC and GRGT DCON
2.3.1.27 WSC and GRGT DSER
2.3.1.28 WSC and GRGT DSER PTP1
2.3.1.29 DSER File System
2.3.1.30 WSC and GRGT Network Configuration
2.3.1.31 DASCON Delog

2.3 ICON
- 2.4.1 Main Screen
- 2.4.2 Master Status
- 2.4.3 Master Command
- 2.4.4 FCRX Card Window
- 2.4.5 IBU Card Window
- 2.4.6 ICON Network Configuration
- 2.4.7 ICON Database Archiving
- 2.4.8 IBUG Report Window
- 2.4.9 ICON Fixed Weight
- 2.4.10 IBU Control Window
- 2.4.11 ICON Control Processor
- 2.4.12 ICON FO Switch
- 2.4.13 ICON FO Switch Control Processor
- 2.4.14 ICON FO Switch NTS

2.5 DCON
- 2.5.1 Main
- 2.5.2 Main Alert Logging
- 2.5.3 DCON IF Switch
- 2.5.4 DCON Network Configuration
- 2.5.5 DMG Control Processor
- 2.5.6 DMG Delog
- 2.5.7 DMG Command
- 2.5.8 DMG Master Status
- 2.5.9 DMU Configuration
- 2.5.10 DMU Card Status
- 2.5.11 DMU Control Window
- 2.5.12 DMG Report Window

2.6 ECON
- 2.6.1 Network Configuration
- 2.6.2 Master Command
- 2.6.3 Master Status
- 2.6.4 Element Status & Controller
- 2.6.5 EMC Report
- 2.6.6 ECON Array Calibration
- 2.6.7 EMC Loopback Test
- 2.6.8 ECON HDLC Interface
- 2.6.9 ECON Clock/Sync
- 2.6.10 ECON Control Processor
- 2.6.11 ECON Covariance Matrix Processor
- 2.6.12 ECON Data Generator

3.0 DAS MAINTENANCE (15 hours)
- 3.1 DAS Maintenance Concepts
- 3.2 Required Test Equipment
- 3.3 Maintenance Controls and Indicators
- 3.4 Preventive Maintenance
- 3.5 Corrective Maintenance
  - 3.5.1 Software Corrective Maintenance
  - 3.5.2 Hardware Corrective Maintenance

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3.5.4 Test and Adjustment Procedures
3.5.5 Built-in Test Equipment
3.5.6 Troubleshooting and LRU Fault Isolation
3.5.7 Diagnostic Testing
3.5.8 Disassembly and Assembly Procedures
3.5.9 Procedures for Replacement of LRUs
3.5.10 Tuning and Alignment
3.5.11 Software Structured Code Overview
4.0 FINAL EXAMINATION AND CRITIQUE (1 hour)

4.1.2.2 DAS Level-2 Training

The DAS Level-2 hardware training course shall consist of 40 hours of instruction over five days duration, and the DAS Level-2 software training course shall consist of 80 hours of instruction over ten days duration.

The initial DAS system-level training course will be a prerequisite for the DAS DMG Level-2 hardware training course and software training course that will concentrate on Level-2 maintenance for the DASCON, DCON, FO Switch CP, and updates to the ECON and ICON.

4.1.2.2.1 Course Outlines

4.1.2.2.1.1 Level-2 Hardware Training

The Level-2 Hardware training course content shall provide training in the following areas:

Course Title: DAS DMG Level-2 Hardware Maintenance (40 hours)

1.0 COURSE INTRODUCTION (4 hours)
1.1 Course Objectives and Purpose
1.2 Review: General Physical and Functional Descriptions of the DMG
1.2.1 High Level System Design Including Algorithm Description
1.3 Review: Level-1 Maintenance Concepts
1.4 Level-2 Maintenance Concepts
1.5 DMG Firmware and Programmable Logic

2.0 DMG LEVEL-2 MAINTENANCE (35 hours)
2.1 Required Test Equipment
2.2 DMG Level-2 Corrective Maintenance
2.2.1 Detailed Theory of Operation
2.2.2 Disassembly and Assembly Procedures
2.2.3 Diagnostic Testing
2.2.4 Detailed Repair Procedures

3.0 FINAL EXAMINATION AND CRITIQUE (1 hour)

4.1.2.2.1.2 Level-2 Software Training

The level 2 software training course will include software training for the following:

- DASCON
- DCON
- ECON (changes only)
- ICON (changes only)
- FO Switch Control Processor

The Level-2 Software training course content shall provide training in the following areas:

Course Title: Demand Access System Level-2 Software Maintenance (80 hours)

1.0 INTRODUCTION (1 hour)
- 1.1 Course Objectives and Purpose
- 1.2 CI Overview
  - 1.2.1 System Description
  - 1.2.2 High Level Architecture
  - 1.2.3 Hardware Configuration

2.0 DASCON (39 hours)

- 2.1 SOFTWARE DESIGN OVERVIEW
  - 2.1.1 CSCI Description
  - 2.1.2 CSC/CSU Module Hierarchy
  - 2.1.3 Key Algorithms
    - 2.1.3.1 DASCON Scheduler
    - 2.1.3.2 Handovers
    - 2.1.3.3 GYPSY Orbit Propagator
  - 2.1.4 Database Organization
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3.0 DCON, ICON, ECON, AND FO SWITCH CONTROL PROCESSOR (40 hours)

3.1 DCON

3.1.1 SOFTWARE DESIGN OVERVIEW
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3.1.1.2 CSC/CSU Module Hierarchy
3.1.1.3 Key Algorithms
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3.1.3.1 Directory Structure
3.1.3.2 Makefiles
3.1.3.3 Data Files
3.1.3.4 Coding Standards and Naming Conventions

3.1.4 TEST ENVIRONMENT
3.1.4.1 Test Configuration
3.1.4.2 Source Code (Changes) for Test Environment
3.1.4.3 External Simulators:
3.1.4.3.1 Test Files
3.1.4.3.2 Emulators
3.1.4.3.3 Test Drivers

3.1.5 CSC/CSU WALKTHROUGH/TRACEABILITY OF SAMPLE OPERATIONAL SCENARIOS
3.1.5.1 Command Events
3.1.5.2 Report Request Events
3.1.5.3 Status Events
3.1.5.4 Extended Status Events
3.1.5.5 Reports

3.1.6 MAINTENANCE PROCEDURES
3.1.6.1 Preventive Maintenance
3.1.6.2 Corrective Maintenance
3.1.6.3 Troubleshooting and Diagnostics

3.1.7 UNIT TEST PROCEDURES AND RESULTS

3.1.8 CONFIGURATION ITEM TEST PROCEDURES AND RESULTS

3.2 ICON

3.2.1 SOFTWARE DESIGN OVERVIEW
- 3.2.1.1 CSCI Description
- 3.2.1.2 CSC/CSU Module Hierarchy
- 3.2.1.3 Key Algorithms
  - 3.2.1.3.1 Beam Weight Computations
  - 3.2.1.3.2 Directional Cosines
- 3.2.1.4 Database Organization
- 3.2.1.5 Executables and Thread Prioritization Schemes

3.2.2 COTS TOOLS
- 3.2.2.1 Production Environment
- 3.2.2.2 Test Environment

3.2.3 PRODUCTION ENVIRONMENT
- 3.2.3.1 Directory Structure
- 3.2.3.2 Makefiles
- 3.2.3.3 Data Files
- 3.2.3.4 Coding Standards and Naming Conventions

3.2.4 TEST ENVIRONMENT
- 3.2.4.1 Test Configuration
- 3.2.4.2 Source Code (Changes) for Test Environment
- 3.2.4.3 External Simulators:
  - 3.2.4.3.1 Test Files
  - 3.2.4.3.2 Emulators
  - 3.2.4.3.3 Test Drivers

3.2.5 CSC/CSU WALKTHROUGH/TRACEABILITY OF SAMPLE OPERATIONAL SCENARIOS
- 3.2.5.1 Command Events
- 3.2.5.2 Report Request Events
- 3.2.5.3 Status Events
- 3.2.5.4 Extended Status Events
- 3.2.5.5 Reports

3.2.6 MAINTENANCE PROCEDURES
- 3.2.6.1 Preventive Maintenance
- 3.2.6.2 Corrective Maintenance
- 3.2.6.3 Troubleshooting and Diagnostics

3.2.7 UNIT TEST PROCEDURES AND RESULTS

3.2.8 CONFIGURATION ITEM TEST PROCEDURES AND RESULTS

3.3 ECON

3.3.1 SOFTWARE DESIGN OVERVIEW
- 3.3.1.1 CSCI Description
- 3.3.1.2 CSC/CSU Module Hierarchy
- 3.3.1.3 Key Algorithms

3.4.4.1 Test Configuration
3.4.4.2 Source Code (Changes) for Test Environment

3.4.5 CSC/CSU WALKTHROUGH/TRACEABILITY OF SAMPLE OPERATIONAL SCENARIOS
3.4.5.1 Command Events
3.4.5.2 Report Request Events
3.4.5.3 Status Events
3.4.5.4 Extended Status Events
3.4.5.5 Reports

3.4.6 MAINTENANCE PROCEDURES
3.4.6.1 Corrective Maintenance
3.4.6.2 Troubleshooting and Diagnostics

3.4.7 CONFIGURATION ITEM TEST PROCEDURES AND RESULTS

4.1.3 Course Materials

Course materials shall include:

- **Instructor Handbook**: This course material will be modularized for presentation and will include course graphics and accompanying written instructor notes. Time allocations to each period of instruction will be provided to ensure adequate coverage of all materials. Learning objectives for each period of instruction will be clearly indicated and presented to the students at the beginning of each session. Solutions to student practical exercises will be explained. Each instructor will have a complete course handbook.

- **Study Guide**: A study guide will be distributed to all students at the beginning of each course. This guide will provide the student with information on the course content, the learning objectives, the class schedule, class etiquette, and study tips. The students will be encouraged to participate in class discussions and to ask questions to ensure that learning is successful.

- **Textbook**: The DAS Operations and Maintenance Manual will serve as the primary syllabus textbook for the initial DAS system-level training course. The Level-2 hardware and software maintenance manuals will serve as the primary syllabi textbooks for the Level-2 training courses. All students will be provided individual CD-ROM copies of these manuals for use during the courses. Instructors may introduce additional supplementary texts at their discretion, but students will not be required to have these texts.

- **Display Books**: Computer-based slide presentations will serve as the primary means for displaying course material. As required, the instructors will provide additional handouts, such as schematics, drawings, or 11 x 17 foldouts, not easily read from overhead projectors.

- **Student Workbooks**: Students will be provided bound paper copies of all presentation material with adequate space for making additional notes. The workbooks will also include practical exercises that may be assigned during or outside class at the discretion of the instructor. Students will be encouraged to bring additional course supplies such as pencils, pens, calculators, and notepads or laptops.

- **Academic and Performance Tests**: In addition to the practical exercises provided in the student workbooks, the instructors will administer a final examination to assess the level to which the students have mastered the course learning objectives. The final examination will be provided to the Government for review in advance to ensure that certification requirements will be met. As

required, the Government will assist the DAS contractor with administrative support of the testing and student certification.

- **Training Aids**: There are no formal training aids, devices or equipment being developed for these courses. However, when appropriate, instructors may convene classes in front of the DAS equipment to demonstrate equipment control features, display panels or alarm indications. Practical exercises to remove and install equipment LRUs can also be accomplished in this setting. Practical demonstrations of Level-2 repair procedures may also be accomplished in this setting. Caution shall be exercised in not physically or electrically damaging operational equipment, in these practical exercises. Whenever practicable, circuit boards or components in for repair should be used.

4.1.4 Course Instructors

The course instructors shall be DAS contractor employees with the prerequisite skills and knowledge in their subject areas. During class sessions there will be two instructors present to the maximum extent practicable. ITT's intent is to have one instructor as a software subject matter expert and a second instructor with knowledge of hardware and maintenance procedures. The contractor will provide a course coordinator who will oversee the administration of the course, and work in liaison with the White Sands training personnel to ensure the success of the training. All students will be given the opportunity at the conclusion of the course to evaluate each instructor. The evaluations will be treated in a confidential manner and provided directly to the Government training course coordinator.

5. TRAINING OBJECTIVES

5.1 LEARNING OBJECTIVES

The following learning objectives are recommended for the DAS Basic Operations and Level-1 Maintenance Course, and the Level-2 Hardware and Software Maintenance Courses. As shown in Tables 5-1 and 5-2, the learning objectives are numbered according to the training course outlines provided in Section 4.

5.1.1 Terminology

In the learning objectives, the use of the following terms indicate the level of understanding or skills demonstration required by the student for successful completion of the learning objective.

- The phrase **"be familiar with"** means the student should understand the general concepts or underlying principles of the objective.
- The phrase **"state"** requires the student to list or describe a concept or procedures related to operations or maintenance of DAS. In general, this will require the student committing some facts to memory for later recall.
- The phrase **"demonstrate"** requires the student to physically perform some action related to DAS operations or maintenance.

5.1.2 DAS Basic Operations and Level-1 Maintenance Course

5.1.2.1 DAS Introduction

Objective Number	Title	Objective Description "The student shall…."
1.1	Course Objectives and Purpose	Be familiar with the purpose and learning objectives of the course.
1.2	General Description: DAS	Be familiar with the DAS mission and purpose.
1.3	Physical and Functional Description	State the subsystems of the DAS architecture and the flow of information through the subsystems.
1.3.1	EMC Interface	State the functional and physical descriptions, LRUs and other main components of the EMC Interface.
1.3.2	IBUG	State the functional and physical descriptions, LRUs and other main components of the IBUG.
1.3.3	IF Switch	State the functional and physical descriptions, LRUs and other main components of the IF Switch.
1.3.4	DMG	State the functional and physical descriptions, LRUs and other main components of the DMG.
1.3.5	Archive/Server (PTP)	State the functional and physical descriptions, LRUs and other main components of the Archive/Server (PTP).
1.3.6	DASCON	State the functional and physical descriptions, LRUs and other main components of the DASCON.
1.3.7	DCON	State the functional and physical descriptions, LRUs and other main components of the DCON
1.3.8	ICON	State the functional and physical descriptions, LRUs and other main

Objective Number	Title	Objective Description "The student shall…."
		components of the ICON.
1.3.9	ECON	State the functional and physical descriptions, LRUs and other main components of the ECON.
1.3.10	Timing and Frequency	State the functional and physical descriptions, LRUs and other main components of the Timing and Frequency Subsystem.
1.3.11	Power and Mechanical	State the functional and physical descriptions, LRUs and other main components of the Power and Mechanical Subsystem.
1.3.12	Network (Ethernet) Equipment	Be familiar with the operating configuration of the network equipment.

5.1.2.2 DAS Operations

Objective Number	Title	Objective Description "The student shall…."
2.1	Theory of Operations	Be familiar with the general theory of operation.
2.1.1	Overall Theory of Operations	Be familiar with the general theory of operation.
2.1.2	Detailed Theory of Operations	Be familiar with the detailed theory of DAS operations.
2.2	SWSI Interface	Be familiar with the purpose and capabilities of SWSI.
2.2.1	SWSI Architecture and DAS/SWSI Interface	State the major components of the DAS/SWSI Interface, and be familiar with the SWSI architecture
2.2.2	DAS Customer SWSI Screens	Be familiar with SWSI Customer screens.
2.2.3	DAS Ground Rules Overview/SWSI User Guide	Be familiar with the DAS Customer Ground Rules/SWSI User Guide.
2.2.4	IERS Upload Procedures	Be familiar with the procedures to upload IERS files into DAS.
2.3	DASCON	State the purpose of DASCON and the DAS Control Hierarchy. Demonstrate the ability to access all other DASCON screens.
2.3.1	Operator Screens and Screen Flow	Shall demonstrate the ability to access requested information using DASCON screens and state the purpose of all screen icons.
2.3.1.1	Access	State the purpose of this screen.
2.3.1.2	Main Alert	State all the connections between DASCON and DAS component systems displayed on this screen
2.3.1.3	Alarm Control	Demonstrate how to enable/disable an alarm sent out by the SSC. State the purposes of the two sub-windows in this window.
2.3.1.4	Main Screen	State the DASCON connections shown in this screen. State how to recognize alarm conditions and equipment status
2.3.1.5	DASCON Schedule Maintenance	State the displays provided on this screen. Demonstrate how to schedule equipment for maintenance.
2.3.1.6	DASCON Schedule SGLT	Be familiar with the 7-day service schedule, and state how to call up a service schedule for a given SGLT.
2.3.1.7	DASCON Event	Be familiar with the contents of this screen. Demonstrate how to call up additional event details.
2.3.1.8	Service Setup	Demonstrate how to setup a service when SWSI is down. State the 5 sub-windows associated with this window.
2.3.1.9	Service Detail	State the configuration parameters set up through this window.
2.3.1.10	DMU Configuration	State the configuration parameters set up through this window.
2.3.1.11	DSER Configuration	State the configuration parameters set up through this window.
2.3.1.12	Ephemeris	State the configuration parameters set up through this window.
2.3.1.13	DAS Parameter Setup	State the DASCON system parameters displayed on this screen.
2.3.1.14	DAS Report	State the purpose of this screen.
2.3.1.15	Data Archiving	State the purpose of this screen.
2.3.1.16	IBU Configuration	State the configuration parameters set up through this window.
2.3.1.17	DASCON Software Status	State other windows invoked by this screen. Demonstrate how to recognize software, operating system and task faults.
2.3.1.18	WSC and GRGT Main	State the components and connections displayed in this window.
2.3.1.19	WSC and GRGT	State how to recognize the operational status of the components shown in

Objective Number	Title	Objective Description "The student shall…."
	EMC/ECON	this display.
2.3.1.20	WSC and GRGT FO Switch	State the components and connections displayed in this window
2.3.1.21	WSC and GRGT IBUG ICON	Demonstrate how to invoke other windows through this screen. State how subsystem connections are displayed in this screen.
2.3.1.22	WSC and GRGT ICON	State the connections shown in this screen and how to obtain operating mode status.
2.3.1.23	WSC and GRGT Fixed Weight	State how many elements are shown in this screen and how changes to the beam weights are entered.
2.3.1.24	WSC and GRGT IF Switch	State the components and connections displayed in this window.
2.3.1.25	WSC and GRGT DMG/DCON	Demonstrate how to invoke other windows through this screen. State how subsystem connections are displayed in this screen.
2.3.1.26	WSC and GRGT DCON	State the connections shown in this screen and how to obtain operating mode status.
2.3.1.27	WSC and GRGT DSER	State the purpose of this window. Demonstrate how to access other windows that can be invoked from this screen.
2.3.1.28	WSC and GRGT DSER PTP1	State the dual purposes of this screen.
2.3.1.29	DSER File System	State how data storage capacity is represented in this screen.
2.3.1.30	WSC and GRGT Network Configuration	State the purpose of this window. State which components have changeable IP addresses.
2.3.1.31	DASCON Delog	State the purpose of this window. State what additional input parameters are required.

5.1.2.2.1 ICON Operations

Objective Number	Title	Objective Description "The student shall…."
2.4	ICON	State the key icons displayed at the bottom of ICON GUI screens. Demonstrate the ability to access all other ICON screens.
2.4.1	Main Screen	State how this screen is used to initialize global variables, start the thread for the Manage CSC, provide access to database files and open the main GUI window.
2.4.2	Master Status	Demonstrate how to select an FCRX for a given IBU.
2.4.3	Master Command	Demonstrate how to input IBUG configuration items, such as IBUG mode and FCRX failover.
2.4.4	FCRX Card window	State how the FCRX status is displayed in this window.
2.4.5	IBU Card Window	State how the IBU Card window displays IBU card status.
2.4.6	ICON Network Configuration	State the purpose of this window.
2.4.7	ICON Data Archiving	State the functions an operator can perform with this screen.
2.4.8	IBUG Report Window	State the sequence of operations required for an operator to select report requests.
2.4.8	ICON Fixed Weight	State the purpose of this window.
2.4.10	IBU Control Window	Demonstrate how an operator will enter Customer and TDRS state vector data to generate direction cosines.
2.4.11	ICON Control Processor	State which component statuses are displayed in this window.
2.4.12	ICON FO Switch	State what Fiber Optic and CDB switch status parameters are shown in this display.
2.4.13	ICON FO Switch Control Processor	State which component statuses are displayed in this window.
2.4.14	ICON FO Switch NTS	State what component status is shown in this window.

5.1.2.2.2 DCON Operations

Objective Number	Title	Objective Description "The student shall…."
2.5	DCON	State the key icons displayed at the bottom of DCON GUI screens.

Objective Number	Title	Objective Description "The student shall…."
		Demonstrate the ability to access all other DCON screens.
2.5.1	Main	State how this screen is used to initialize global variables, start the thread for the Manage Status CSC, provide access to database files and open the main GUI window.
2.5.2	Main Alert Logging	State the display alerts and processing messages provided for the DMGs and the IF switch in this display.
2.5.3	DCON IF Switch	State how an operator can alter connections between an IBU and a DMU through this screen.
2.5.4	DCON Network Configuration	State how an operator will enter an IP address for each DMG and the DASCON through this screen.
2.5.5	DMG Control Processor	State the DMG components for which this screen provides status information.
2.5.6	DMG Delog	State the functions of the archiving menu and how an operator will use key searches to access archived information.
2.5.7	DMG Command	State the current DMG modes that are displayed in this screen. Demonstrate the use of the screen icons to access other DCON related information.
2.5.8	DMG Master Status	State the types of status information provided by this screen. Demonstrate the use of the screen icons to access other DCON related information.
2.5.9	DMU Configuration	State the DMU parameters that are settable through this screen. Demonstrate the use of the screen icons to access other DCON related information.
2.5.10	DMU Card Status	State the DMU parameters that are observable through this screen. Demonstrate the use of the screen icons to access other DCON related information.
2.5.11	DMU Control Window	State how an operator enters Customer and TDRS state vectors through this screen. Demonstrate how to enter a given state vector.
2.5.12	DMG Report Window	State the DMG status reports that are accessible through this screen.

5.1.2.2.3 ECON Operations

Objective Number	Title	Objective Description "The student shall…."
2.6	ECON	State the key icons displayed at the bottom of ECON GUI screens. Demonstrate the ability to access all other ECON screens.
2.6.1	Network Configuration	State how an operator enters an IP address of the ECON control processor through this screen.
2.6.2	Master Command	State the functions this screen provides an operator in commanding an EMC.
2.6.3	Master Status	State the components of an EMC that have status information displayed in this screen.
2.6.4	Element Status and Controller	State the EMC elements that have status information displayed in this screen.
2.6.5	EMC Report	State the report types that may be requested through this screen.
2.6.6	ECON Array Calibration	State how state vectors and direction cosines are displayed in this screen.
2.6.7	EMC Loopback Test	State how this screen provides an operator with a means to conduct a loopback test.
2.6.8	ECON HDLC Interface	State how an operator can change the configuration of an EMC connection to a MABE controller through this screen.
2.6.9	ECON Clock/Sync	State the EMC clock sources that are selectable through this screen.
2.6.10	ECON Control Processor	State the ECON components that have status displayed in this screen.
2.6.11	ECON Covariance Matrix	State how covariance matrix errors are displayed in this screen.
2.6.12	ECON Data Generator	State how an operator can select a scenario and generate a data file for an EMC interface to send to the EMC CSCI.

5.1.2.3 DAS Maintenance

Objective Number	Title	Objective Description "The student shall…."
3.0	DAS Maintenance	State what constitutes Level-1 maintenance and describe how it applies to DAS.
3.1	DAS Maintenance Concepts	State the DAS maintenance concept in terms of equipment removal and replacement, and where repair will be made for HW and SW.
3.2	Required Test Equipment	State the major pieces of test equipment required for DAS Level-1 maintenance. Be familiar with the minimum specification requirements for this equipment.
3.3	Maintenance Control and Indicators	Be familiar the maintenance control and indicators provided in equipment front panel displays. (Other indicators are found in the CI GUI screens.)
3.4	Preventive Maintenance	State the components of a given DAS CI that will require periodic inspections. Be familiar with common inspection actions and their required schedule for performance.
3.5	Corrective Maintenance	State the differences between general faults and subsystem faults.
3.5.1	SW Corrective Maintenance	Be familiar with the software corrective maintenance steps required to return a device to normal operations.
3.5.2	HW Corrective Maintenance	Demonstrate the ability to locate repair procedures in the DAS O&M manual, when given subsystem fault indications.
3.5.2.1	General Faults	Demonstrate the ability to identify a general fault condition when given specific fault indications.
3.5.2.2	Alarm Conditions	State the fault indicated based on a specific alarm indication.
3.5.3	Minimum Performance Standards	Be familiar with the minimum performance standards of all DAS subsystem equipment.
3.5.4	Test and Adjustment Procedures	Be familiar with the required test and adjustment procedures for each HW subsystem within DAS, if applicable.
3.5.5	Built-In Test Equipment	Be familiar with equipment built in tests, on power-up, when on-line, and when off-line. Be familiar with which tests require operator intervention.
3.5.6	Troubleshooting and LRU Fault Isolation	Demonstrate adherence to proper fault isolation techniques in the O&M Manual to locate faulty LRUs when given fault indications.
3.5.7	Diagnostic Testing	Be familiar with any DAS components that have diagnostics other than built-in tests.
3.5.8	Disassembly and Assembly	State any special assembly or disassembly procedures that are required during the nominal DAS operations.
3.5.9	Procedures for LRU Replacement	Be familiar with the O&M manual procedures to replace a faulty LRU.
3.5.10	Tuning and Alignment	Be familiar with any tuning and alignment procedures described in the DAS O&M Manual.
3.5.11	Structure Software Code Overview	Be familiar with hierarchical structure of the DAS software and firmware code described in the O&M Manual and design documents.

5.1.3 DAS DMG Level-2 Maintenance Courses

5.1.3.1 Level-2 Hardware Corrective Maintenance

5.1.3.1.1 Course Introduction

Objective Number	Title	Objective Description "The student shall…."
1.1	Course Objectives and Purpose	Be familiar with the purpose and learning objectives of the course.
1.2	Review: General Physical and Functional Descriptions of the DMG	Be able to state the functional and physical descriptions, LRUs and other main components of the DMG.
1.2.1	High Level System	Be familiar with the DMG system design and key algorithms

Objective Number	Title	Objective Description "The student shall…."
	Design Including Algorithm Description	
1.3	Review: Level-1 Maintenance Concepts	Be familiar with the Level-1 preventive and corrective maintenance procedures
1.4	Level-2 Maintenance Concepts	Be familiar with the concepts of Level-2 maintenance and know the difference between Level-1 and Level-2 maintenance
1.5	DMG Firmware and Programmable Logic	Be familiar with the DMG firmware and programmable logic design

5.1.3.1.2 DMG Level-2 Maintenance

Objective Number	Title	Objective Description "The student shall…."
2.1	Required Test Equipment	State the major pieces of test equipment required for DMG Level-2 maintenance. Be familiar with the minimum specification requirements for this equipment.
2.3	DMG Level-2 Corrective Maintenance	Be familiar with the Level-2 corrective maintenance concepts applied to the DMG
2.3.1	Detailed Theory of Operation	Be familiar with the theory behind the operation of the DMG components
2.3.2	Disassembly and Assembly Procedures	State any special assembly or disassembly procedures that are required to perform Level-2 maintenance (repair)
2.3.3	Diagnostic Testing	State how to diagnose DMG component failures
2.3.4	Detailed Repair Procedures	State how to repair DMG components

5.1.3.2 Level-2 Software Maintenance

5.1.3.2.1 Introduction

Objective Number	Title	Objective Description "The student shall…."
1.1	Course Objectives and Purpose	Be familiar with the purpose and learning objectives of the course.
1.2	CI Overview	Be familiar with the architecture and description of each of the software configuration items
1.2.1	System Description	Be familiar with the system description of each of the software configuration items
1.2.2	High Level Architecture	Be familiar with the high level architecture of each of the software configuration items
1.2.3	Hardware Configuration	Be familiar with the hardware configuration necessary to support the DASCON, DCON, ICON, and ECON, as well as the FO Switch Control Processor

5.1.3.2.2 Software Design Overview

Objective Number	Title	Objective Description "The student shall…."
2.1	CSCI Description	Be familiar with description of each computer software

Objective Number	Title	Objective Description "The student shall…."
		configuration item
2.2	CSC/CSU Module Hierarchy	Be familiar with the DASCON, DCON, ECON, ICON, and FO Switch Control Processor computer software component/unit module hierarchy
2.3	Key Algorithms	Be familiar with key algorithms for the DASCON, DCON, ECON, and ICON software designs
2.4	Database Organization	Be familiar with the database organization of the DASCON, DCON, and ICON
2.5	Executibles and Thread Prioritization Schemes	Be familiar with the executibles and thread prioritization schemes of the DASCON, DCON, ECON, ICON and FO Switch Control Processor

5.1.3.2.3 COTS Tools

Objective Number	Title	Objective Description "The student shall…."
3.1	Production Environment	Be familiar with the COTS tools used in the S/W production environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
3.2	Test Environment	Be familiar with the COTS tools used in the S/W test environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor

5.1.3.2.4 Production Environment

Objective Number	Title	Objective Description "The student shall…."
4.1	Directory Structure	Be familiar with the directory structure used in the S/W production environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
4.2	Makefiles	Be familiar with the makefiles used in the S/W production environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
4.3	Data Files	Be familiar with the data files used in the S/W production environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
4.4	Coding Standards and Naming Conventions	Be familiar with the coding standards and naming conventions used in the S/W production environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor

5.1.3.2.5 Test Environment

Objective Number	Title	Objective Description "The student shall…."

Objective Number	Title	Objective Description "The student shall…."
5.1	Test Configuration	Be familiar with the test configurations used in the S/W test environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
5.2	Source Code (Changes) for Test Environment	Be familiar with the source code used in the S/W test environment of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor
5.3	External Simulators:	Be familiar with the external simulators used in the S/W test environment of the DASCON, DCON, ECON, and ICON
5.3.1	Test Files	Be familiar with the test files used in the S/W test environment of the DASCON, DCON, ECON, and ICON
5.3.2	Emulators	Be familiar with the emulators used in the S/W test environment of the DASCON, DCON, ECON, and ICON
5.3.3	Test Drivers	Be familiar with the test drivers used in the S/W test environment of the DASCON, DCON, ECON, and ICON

5.1.3.2.6 CSC/CSU Walkthrough/Traceability of Sample Operational Scenarios

Objective Number	Title	Objective Description "The student shall…."
6.1	Command Events	Be familiar with the command events of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software component/unit operational scenarios
6.2	Report Request Events	Be familiar with the report request events of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software component/unit operational scenarios
6.3	Status Events	Be familiar with the status events of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software component/unit operational scenarios
6.4	Extended Status Events	Be familiar with the extended status events of the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software component/unit operational scenarios
6.5	Reports	Be familiar with the reports generated in the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software component/unit operational scenarios

5.1.3.2.7 Maintenance Procedures

Objective Number	Title	Objective Description "The student shall…."
7.1	Preventive Maintenance	Demonstrate the ability to perform preventive maintenance on the DASCON, DCON, ECON, and ICON software components/units
7.2	Corrective Maintenance	State the difference between preventive and corrective maintenance. Demonstrate the ability to perform corrective maintenance on the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software components/units
7.3	Troubleshooting and Diagnostics	Be familiar with the troubleshooting and diagnostic techniques and demonstrate the ability to troubleshoot and diagnose problems in the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software components/units

5.1.3.2.8 Unit Test Procedures and Results

Objective Number	Title	Objective Description "The student shall…."
8.1	Unit Test Procedures and Results	State the test procedures and expected results for the DASCON, DCON, ECON, and ICON software units

5.1.3.2.9 Configuration Item Test Procedures and Results

Objective Number	Title	Objective Description "The student shall…."
9.1	Configuration Item Test Procedures and Results	State the test procedures and expected results for the DASCON, DCON, ECON, ICON, and FO Switch Control Processor software configuration items

6. STUDENT REQUIREMENTS

6.1 STUDENT PROFILES

In general, seven different categories of students for DAS training have been identified. These categories include:

- **TOCC Operators**: These personnel are anticipated to have very little interaction with DAS. They will be required to monitor certain displays on the WSC system to watch for alerts or fault indications. In response, the TOCC operators would dispatch a line maintenance technician to DAS to resolve the fault. The TOCC operators are required to input commands to initiate TDRS state vectors when requested by DASCON. Their prerequisite skills and proficiency levels should already be demonstrated with the operation of existing WSC TOCC equipment.

- **Line Maintenance Technicians (LMTs)**: These personnel will comprise the majority of the student population requiring DAS training. Their knowledge requirements include the DAS introduction, concept of operations, theory of operation, subsystem functional descriptions, use of GUI screens and maintenance training. Their prerequisites for skills and proficiency levels should be commensurate with LMTs currently supporting similar WSGT or GRGT hardware and software systems to include TGBFS or WDISC.

- **HMD Technicians**: These personnel would attend the DAS initial training course, followed by hardware Level-2 maintenance training. Maintenance certification for both Level-1 and Level-2 is recommended. However, with prior HMD maintenance skills and proficiency in repairing similar equipments, such as the TGBFS, only Level-2 training may be needed. This is to be determined by NASA CSOC or designated contractor-training personnel.

- **System/Database Administrator (SA/DA):** These personnel will require both basic and more advanced DAS training. In addition to the basic system training, the SA should be knowledgeable in IP networking, have an understanding of the DAS "ground rules", and have a working knowledge of the SWSI system and the NASA IP Operational networks (NISN IOnets). The DA should be trained in Oracle and MS Access DBMS administration and have basic Linux and Windows NT system administration skills. This person should be knowledgeable in accessing the DAS database, be capable of adding new or deleting old DAS customers into the system database, and skilled in entering, modifying and deleting DAS customer service requests at the DASCON local control and monitor (LCM). The DA should also have an understanding of the DAS "ground rules" and have a working knowledge of the SWSI system and the NASA IP Operational networks (NISN IOnets) to assist the SA in system administration functions. The DA will be the key liaison with DAS customers and have a working relationship with SWSI personnel to assist resolving interface problems between the two systems.

- **Software Configuration Management (SCM):** SCM will maintain the software and firmware baselines associated with DAS. In compliance with WSC processes, SCM will include providing the formal configured builds of the software/firmware files, maintenance of Test, Staging and Master baselines for the code and executables generated by SCM, and delivery of SCM-configured files to the operational systems either for test or as a formal delivery. Additionally, SCM activities will include generating and maintaining backup copies of the software/firmware and system backups in off-site storage for disaster recovery purposes. Existing skills are capable of handling the administrative processes involved. SCM personnel will require training in the compilation and linking of any software/firmware involving compilers not currently in use at

WSC and licensed copies of all compilers (the version(s) used in developing the software/firmware) for use in the SCM processes.

- **Network Management**: These personnel will require a working knowledge of the DAS data distribution network from the archive data server output to the NISN closed IOnet point of presence. They will also require a working knowledge of the Guam Data Interface System (GDIS) network and the routers used to support services at the GRGT. These personnel should be proficient in the maintenance of network equipment components such as routers, hubs and switches.

- **Software/Firmware**: These personnel will be required to maintain DAS software and firmware at the SMTF. Software programmers will require knowledge/experience in the following programming languages: C/C++, Python, and XML; and training/equivalent experience in coding, compiling/linking, and debugging in the following integrated development environments/compilers: GCC/GDB/Python 1.5.2, Microsoft Visual Studio ver 5.0, Tornado 1.0 and 2.0, and VisualDSP++. They must also possess the basic skills necessary to test any software/firmware interfaces with the installed databases. Firmware programmers, for hardware logic maintenance, will require knowledge/experience in the VHDL language and training/equivalent experience with the following integrated development environments/compilers: Xilinx Foundation ver 2.1 and 3.3, Altera MaxPlus II 9.6, and FPGA Express for Altera. They will require knowledge of the DAS software code structure and be skilled in implementing diagnostics and creating software modifications to correct bugs. The firmware programmers will also require knowledge in the hardware logic download/installation process for delivery via JTAG chain using MaxPlus II and delivery via WSC EEPROM programmers.

- **DAS Instructors**: These Government or support contractor personnel may be required to provide future instruction on DAS operations and maintenance. Their participation in the initial training course is essential for further course completion and instructor certification. Their prerequisite skills should include other operator or maintenance training in equipment similar to that used in DAS.

Table 6-1 provides a comparison of the student requirements for DAS training versus the training course content. An "X" indicates a course requirement, and an "O" indicates an optional requirement. Additional training course information is identified where the current basic training does not adequately meet the projected skills or knowledge base requirements for the identified personnel. The initial DAS training includes the first three elements – DAS Introduction, DAS Operations, and DAS Level-1 Maintenance. Additional course elements, shown in Table 6-1, will require further advanced training.

Table 6-1: Personnel Requirements for DAS Training

	TOCC Operator	LMT	HMD Technician	SA/DA/ SCM	Network Management	SMTF Technician	DAS Instructors
DAS BASIC OPERATIONS AND LEVEL-1 MAINTENANCE							
DAS Introduction	x	x	X	x	x	O	x
DAS Operations	O	x	X	X	O	O	x
DAS Maintenance (Level-1)		x	X	X	O	O	x
DMG HARDWARE LEVEL-2 MAINTENANCE							
DMG Maintenance (Level-2)		O	X			O	X

SOFTWARE/FIRMWARE MAINTENANCE							
SMTF Maintenance						X	X
DAS Database Administration		O		X		X	X
DASCON/DCON/ICON/ ECON/FO Switch Control Processor Maintenance (Level-2)		O		X		X	X
ADDITIONAL INFORMAL DAS TRAINING							
SWSI Operations[1]		O		X			X
DAS Ground Rules[1]		O		X			X
Note 1: SWSI Operations and DAS Ground Rules overviews will be provided in initial training. Additional advanced training may be considered for System Administrators, Software Configuration Managers, and DAS Instructor trainees.							

7. TEST AND CERTIFICATION PROCEDURES

7.1 OVERVIEW

At the beginning of each course of instruction, the students will be presented with a set of training course learning objectives. They will be required to demonstrate a specified level of proficiency in these skills or an understanding of the subject matter described by the learning objectives as a prerequisite for course completion or certification.

During the course of instruction, the instructors will ensure that an appropriate amount of instruction is provided so that students of similar educational and work experience backgrounds can meet the course learning objectives. However, the responsibility for acquiring the knowledge or skill base to meet the learning objectives rests with the students. The students also will be responsible for attending all required training sessions and completing all assignments. In the event a student misses a session, arrangements should be made with the instructor to make-up the training. The instructors will provide additional instruction or make-up sessions, if in their estimation; the students do not adequately comprehend the subject matter or have missed a training session for a valid reason. This will be determined at the instructors' discretion.

At the conclusion of the course (except for the Level-2 software maintenance courses), the students will be administered a final examination to demonstrate their knowledge or understanding of the learning objectives. The final examination will consist of written questions and practical demonstrations of certain skills. A score of 70% correct answers of all aspects of the final examination must be achieved in order for a student to meet Level 1 certification requirements.

Level 1 Certification is a "line maintenance" certification and is required of all personnel who will operate the equipment in real-time, and thus will not have time for a review of their actions prior to their actions having effects. Level 1 certification requires a test (usually written, though a performance evaluation may be performed). A record of the test & performance is retained and made available for inspection.

Level 2 Certification is recognition of expertise - the individual "knows" the equipment to the level that he can perform component level maintenance on the equipment. Level 2 can be awarded without the need of a test or evaluation, other than the evaluation made by the maintenance supervisor. Level 2 personnel repair boxes that the Level 1 personnel will test prior to assigning them to active use - thus there is an independent evaluation of their work, prior to their work impacting real-time operations.

The requirements for Level 2 certification are therefore "simpler" that the requirements for Level 1 Certification. Normal practice is to require a person to achieve Level 1 Certification prior to awarding Level 2 Certification. Usually Shift Leads and HMD personnel would be eligible for a Level 2 Certification.

The instructors will provide a list of all students meeting the certification requirements. This will be reviewed by the course coordinator and provided to the Government training coordinator for entry into the student training records.

The students will be afforded an opportunity to critique each course of instruction and the instructors' performance of the training. This will be provided directly to the Government training coordinator, who will provide feedback to the ITT course coordinator concerning ways to improve course content and instructional techniques.

7.2 GOVERNMENT TEST AND CERTIFICATION RESPONSIBILITIES

7.2.1 NASA Certification Responsibilities

The DAS Technical Lead and a NASA CSOC or designated contractor training coordinator will be responsible for:

- Providing the course developers with initial guidance relating to NASA training course certification procedures.
- Reviewing and approving the set of learning objectives, course content, and training materials provided by the ITT course developers to ensure that the training courses meet NASA standards for training course certification.
- Reviewing and approving the course final examinations to ensure that they adequately cover a reasonable cross-section of the training course curriculum and are developed to accurately measure the level of comprehension of the stated learning objectives. A raw score of 70% will be used as the threshold for student Level 1 maintenance certification.
- Providing administrative support for the testing and certification of students.

7.2.2 Student Responsibilities

In order to meet course certification requirements, the students must:

- Demonstrate the subject area knowledge and skills base to operate or maintain the DAS system.
- Participate in all scheduled training activities for all DAS training courses attended.
- Make arrangements with the course instructors to make up any missed sessions due to valid reasons for absence.
- Complete all workbook and homework assignments in a timely manner prior to course completion.
- Take and successfully obtain a passing score of 70% or higher on all DAS training course final examinations.
- Complete a course evaluation form at the conclusion of each course of instruction.

7.3 CONTRACTOR RESPONSIBILITIES

The contractor course developers and instructors shall ensure that all training courses meet the Government requirements for DAS operator and maintainer certification. This will require coordination between ITT and NASA in the early stages of course development in order to ensure that certification requirements are adequately addressed in a timely manner.

7.3.1 ITT Course Developer

The ITT course developer will establish learning objectives that span each DAS training course content and will provide those objectives, as part of this training plan, to NASA for review prior to the development of the training materials. The ITT course developer will ensure that the learning objectives and this plan meet NASA certification requirements. Upon approval, the course developer will ensure that the approved learning objectives are accurately presented in the DAS training materials. In conjunction with the course instructors, the course developer will create a final certification examination to provide a measure of the level of attainment of the subject matter in the learning objectives for course certification. The developer will ensure that the final certification examination covers a cross-sectional representation of the learning objectives. The certification examination will be provided to NASA as part of the training materials deliverable.

7.3.2 ITT Instructors

The ITT instructors will provide the training as specified in this training plan and according to any guidance provided by NASA. The instructors will:

- Provide all instruction according to the Instructor Workbook syllabi.
- Administer a final certification to all students at the conclusion of each training course. This includes monitoring the progress of the examination and scoring the completed exams.
- Ensure that all students have attended all scheduled training activities, unless excused for a valid reason. Attendance is required for eligibility to sit for the final examination.
- Ensure that all students make up any missed training sessions.
- Verify that all assigned class work and homework assignments are completed.
- Provide a list of all students to NASA, who successfully obtain a score of 70% or better on the final certification examinations and also meet all other course certification criteria.

7.4 CERTIFICATION EXAMINATION CONTENT

The final examinations will be no less than one hour in duration and contain a minimum of 50 questions. The written portion of the examinations will contain multiple choice, true/false, or fill-in-the-blank responses. The final examinations may contain at least one practical exercise for the student to demonstrate at the discretion of the instructor. The cross-sectional distribution of examination questions will come from the learning objectives as provided in the following Table 7-1.

Table 7-1: Certification Examination Content Percentages

DAS Basic Operator and Maintainer Training Course	
DAS Introduction	20%
DAS Operations	40%
DAS Maintenance	40%
DAS Level-2 Hardware Training Course	
Introduction	10%
Maintenance	90%

ABBREVIATIONS AND ACRONYMS

ASIC	Application Specific Integrated Circuits
ASCII	American National Standard Code for Information Interchange
CDB	Common Data Broadcast
CI	Configuration Item
CM	Configuration Management
COTS	Commercial Off The Shelf
CSOC	Consolidated Space Operations Center
DAS	Demand Access System
DASCON	Demand Access System Controller
DCON	Demodulator Group Controller
DMG	Demodulator Group
DRL	Data Requirements List
DSER	Data Archive/Server
ECON	Element Multiplexer Correlator Controller
EMC	Element Multiplexer Correlator
FCRX	Fibre Channel Receiver
FO	Fiber Optic
GDIS	Guam Data Interface System
GRGT	Guam Remote Ground Terminal
GSFC	Goddard Space Flight Center
GUI	Graphic User Interface
HDLC	High Level Data Link Control
HMD	Hardware Maintenance Depot
HW	Hardware
IBU	Independent Beamforming Units
IBUG	Independent Beamforming Unit Group
ICD	Interface Control Document
ICON	IBUG Controller
IERS	International Earth Rotation Service
IF	Intermediate Frequency
ILS	Integrated Logistics Support

ILSP	Integrated Logistics Support Plan
LCM	Local Control Monitor
LMTs	Line Maintenance Technicians
LRUs	Line Replaceable Units
LSD	Logistics Support Depot
MABE	Multiple Access Beamforming Equipment
MAR	Multiple Access Return
MHz	Mega Hertz
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
NASA	National Aeronautics and Space Administration
NHB	NASA Handbook
NISN	NASA Information Systems Network
NTS	Network Transparent Switch
O&M	Operations and Maintenance
OEMs	Original Equipment Manufacturer
PMP	Product Management Plan
PTP	Programmable Telemetry Processor
QA	Quality Assurance
RMA	Reliability, Maintainability and Availability
SA	System Administrator
SCM	Software Configuration Manager
SGLT	Space Ground Link Terminal
SMTF	Software Maintenance and Test Facility
SN	Space Network
SRD	System Requirements Document
SSC	Service Specification Code
STADIR	Station Director
STDN	Space Flight Tracking and Data Network
STGT	Second TDRSS Ground Terminal
SW	Software

SWSI	Space Network Web Services Interface
TD&D	Technical Data & Documentation
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TGBFS	Third Generation Beamforming System
TIP	Technical Information Program
TOCC	TDRSS Operation Control Center
TP	Training Plan
TRR	Test Readiness Review
WDISC	WSC TCP/IP Data Interface Services Capability
WSC	White Sands Complex (which consists of STGT, WSGT, and GRGT)
WSGT	White Sands Ground Terminal